

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Amendment of Parts 2 and 25 of the)	
Commission's Rules to Allocate Spectrum and)	IB Docket No. 07-101
Adopt Service Rules and Procedures to Govern)	
the Use of Vehicle-Mounted Earth Stations in)	
Certain Frequency Bands Allocated to the Fixed-)	
Satellite Service)	

To: The Commission

**COMMENTS OF
THE BOEING COMPANY**

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August 17, 2007

SUMMARY

Boeing supports the Commission's efforts to serve the public interest by establishing a regulatory regime for vehicle mounted earth stations ("VMES") to expand the availability of mobile broadband services and efficiently use the Ku-band spectrum. Boeing, however, urges the Commission to concurrently address the regulatory status of other mobile services that are provided in Ku-band fixed-satellite service ("FSS") spectrum in order to ensure that they are not subjected to an unnecessary risk of harmful interference. Specifically, the Commission should refrain from designating VMES as an application of the Ku-band FSS allocation without concurrently designating earth stations mounted on other mobile platforms, such as aircraft, as an application of the primary FSS allocation.

The Commission should take such action by adopting technically-neutral regulations that do not discriminate against any particular technology or service based on mounting vehicle. Many currently available technologies, including active radio frequency tracking and predictive tracking antennas, electronic phased array antennas and spread spectrum modulations, are not dependent upon the type of vehicle on which they are mounted for successful use. The Commission, however, may need to address application-specific considerations on a case-by-case basis in licensing conditions to account for certain technical and practical considerations that differentiate trucks, ships and aircraft.

The Commission should permit VMES and aircraft-mounted earth stations (hereinafter referred to as "AMES") to operate throughout the Ku-band FSS frequencies. Boeing supports the Commission's proposed footnotes NGxxx and NGyyy showing

VMES as an application of the FSS in the Ku-band. Boeing, however, urges the Commission to also include AMES in the footnotes. Further, VMES and AMES should be permitted to operate in the 10.95-11.2 GHz and 11.45-11.7 GHz bands on a non-protected basis because there is no technical difference between VMES, AMES and earth stations on board vessels (“ESVs”) that requires divergent treatment in the band. Finally, Boeing supports the Commission’s proposal to allow VMES to operate within the 125 km protection zone around the TDRSS receive facilities only after coordinating with such facilities, and supports identical treatment for AMES.

Additional technical restrictions for VMES and AMES such as the $10 \cdot \log(N)$ rule, pointing accuracy, cease transmit, minimum antenna size, antenna tracking performance or tracking accuracy are not necessary, as long as the proposed mobile application can meet the off-axis e.i.r.p. density limits in Section 25.222 of the Commission’s rules for a two degree spacing environment. The Section 25.222 mask should apply to VMES and AMES applications without an arbitrary 1 dB reduction. Further, any adjustments made to the mask that are adopted in the Part 25 proceeding should be applied equally to VMES, ESVs and AMES.

Several of the rules proposed in the *NPRM* for VMES are unnecessary to protect other users of the Ku-band FSS frequencies. Specifically, the Commission should:

- require an aggregate e.i.r.p. density envelop rather than the $10 \cdot \log(N)$ rule;
- adopt a three-degree starting angle outside the GSO orbital plane;
- decline to impose the ESV pointing accuracy and transmission cessation rules to VMES and AMES because operators can demonstrate compliance with the e.i.r.p. density limits without such restrictions;
- protect all receive antennas up to the levels indicated in Section 25.209(c) regardless of size; and

- refrain from restricting the use of VMES and AMES services to government customers, or other limited user groups.

Boeing supports the Commission's proposal to extend the ESV data logging requirements to VMES. This requirement, however, is one where differences in mounting vehicle are material. ESVs must collect data in twenty minute intervals. In contrast, the Commission proposed to require aeronautical mobile-satellite services ("AMSS") networks to collect data far more frequently. Due to the fact that terrestrial vehicles often travel much faster than ships, but not as fast as airplanes, Boeing proposes that the Commission require VMES operators to collect the applicable data at ninety second intervals. In addition, Boeing contends that retaining this data for ninety days would be adequate to address interference concerns, rather than the one year requirement applicable to ESVs.

Boeing also supports the 24/7 U.S. point of contact proposed in the *NPRM* to address interference concerns. Boeing does not support, however, a requirement that operators control all VMES terminals through the use of an earth station hub in the United States, a requirement that is not included in the ESV rules if a U.S. 24/7 point of contact is maintained.

The Commission must ensure that measures to control radiation hazards are adequate to address VMES, which involve concerns not applicable for ESVs and AMES. Boeing supports requirements for labeling, professional installation, and transmission cessation after signal loss from the satellite. In addition, as it did for ESVs and AMSS, Boeing supports blanket licensing and ALSAT authority for VMES. Finally, the Commission should ensure regulatory parity for federal and non-federal earth stations

accessing commercial satellite spectrum with identical interference protection, data logging and other requirements.

TABLE OF CONTENTS

I.	INTRODUCTION	3
II.	THE COMMISSION SHOULD ADOPT INTERFERENCE RULES FOR FSS EARTH STATIONS THAT DO NOT DISCRIMINATE BASED ON TECHNOLOGY, APPLICATION OR MOUNTING PLATFORM	4
A.	The Commission Should Refrain From Designating VMES as an Application of the FSS in the Ku-Band Without Concurrently Designating Aircraft Mounted Earth Stations as an Application of the FSS in the Ku-Band	8
B.	The International Nature of Aeronautical Services Does Not Lessen the Need for the Commission to Designate AMES as an Application of the Ku-Band FSS in the United States.....	12
C.	The Commission Has Provided Adequate Notice to Designate AMES as an Application of the FSS in the Ku-Band	13
III.	VMES AND AMES OPERATIONS SHOULD BE PERMITTED THROUGHOUT THE KU-BAND FSS FREQUENCIES.....	16
A.	A Footnote Should Be Added to the U.S. Table of Frequencies for the 11.7-12.2 GHz and 14.0-14.5 GHz Bands Addressing Both VMES and AMES	16
B.	VMES and AMES Operations Should Be Permitted in the 10.95-11.2 GHz and 11.45-11.7 GHz Bands on a Non-Protected Basis.....	17
C.	VMES and AMES Operating in the 14.0-14.2 GHz Band Should Be Allowed Within the 125 Km Protection Zone Around the Tracking and Data Relay Satellite System Receive Facilities, But Should Coordinate With Such Facilities	18
IV.	ASSUMING THE OFF-AXIS EIRP DENSITY LIMITS ARE MET, ADDITIONAL RESTRICTIONS ARE NOT NECESSARY FOR VMES AND AMES NETWORKS	19
A.	VMES and AMES Operations Should be Subject to the Commission's Off-Axis EIRP Density Limits in Section 25.222(a) of the Rules.....	21
B.	The Commission Should Require an Aggregate EIRP Density Envelope Rather Than the 10*Log(N) Rule	22
C.	The Commission Should Adopt a Three-Degree Starting Angle Outside the GSO Orbital Plane	23
D.	The Commission's ESV Rules Regarding Pointing Accuracy and Transmission Cessation Should Not Be Applied to VMES or AMES	23
E.	Regardless of Size, All Receive Antennas Should Be Entitled to the Same Level of Protection.....	26

F. VMES and AMES Licensing Should Not be Limited to Government Applications	27
V. VMES AND AMES SHOULD BE SUBJECT TO APPROPRIATE SYSTEM MONITORING, DATA LOGGING AND EMERGENCY CONTACT REQUIREMENTS.....	27
A. VMES and AMES Networks Should Comply With Data Logging Requirements that are Similar to Those Applied to ESVs.....	28
B. The Commission Should Require VMES and AMES Operators to Maintain a 24/7 U.S. Point of Contact, But Not a U.S. Earth Station Hub	30
VI. THE COMMISSION MUST ENSURE THAT MEASURES TO CONTROL RADIATION HAZARDS ARE ADEQUATE TO ADDRESS MOBILE ENVIRONMENTS	31
VII. VMES AND AMES NETWORKS SHOULD BE BLANKET LICENSED AND GRANTED ALSAT AUTHORITY	32
A. VMES and AMES Networks Should Be Granted Blanket Licenses	32
B. VMES and AMES Networks Should Be Granted ALSAT Authority	33
VIII. THE COMMISSION SHOULD ENSURE REGULATORY PARITY FOR FEDERAL AND NON-FEDERAL EARTH STATIONS ACCESSING COMMERCIAL SATELLITE SPECTRUM	34
IX. CONCLUSION.....	35

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**COMMENTS OF
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The Boeing Company ("Boeing"), by its attorneys and pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415, hereby submits the following comments in response to the above-referenced Notice of Proposed Rulemaking ("*NPRM*" or "*VMES NPRM*")¹ regarding the adoption of service rules and procedures governing the operation of vehicle-mounted earth stations ("VMES") in Ku-band fixed-satellite service ("FSS") frequencies.²

Boeing's contributions to this proceeding reflect Boeing's diverse interests in the satellite manufacturing and services industry. Boeing was a major proponent in the

¹ Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service, IB Docket No. 07-101, *Notice of Proposed Rulemaking*, FCC 07-86, (released May 15, 2007) ("*NPRM*").

² Boeing is concurrently filing these comments for inclusion in the record for IB Docket No. 05-20.

development of spectrum allocations and services rules enabling the introduction of aeronautical and maritime satellite services in Ku-band FSS frequencies.

Boeing provides aeronautical advanced broadband communications services to U.S. Government aircraft pursuant to a contract with the U.S. Air Force Materiel Command. The government recently renewed Boeing's contract, suggesting a continuing need for Boeing's services for the foreseeable future. Pursuant to the contract, Boeing provides advanced broadband services to more than a dozen Very Important Personnel/Special Air Mission aircraft operated by the U.S. Air Force Air Mobility Command to transport senior leadership of the U.S. Government and Department of Defense.³

In addition, Boeing provided the first Ku-band satellite-based, broadband Internet system which allowed transoceanic maritime vessels access to information at speeds significantly higher than those of previous maritime communications systems. The high data rate enabled multiple, simultaneous maritime users to access the Internet, corporate intranet, and e-mail, as well as obtain additional information for vessel management such as location, heading and speed, supply and cargo status, weather, routing and port information.⁴

Boeing is also working with the federal government regarding VMES broadband applications that its government customers may need to support military and civilian operations. Boeing has tested VMES applications pursuant to multiple experimental

³ Typical applications for this contract include Internet, E-mail, video teleconferencing, server access, and access to Direct Broadcast Satellite television service compatible with the Boeing system.

⁴ See The Boeing Company, *News Release*, (April 5, 2006) (available at http://www.boeing.com/news/releases/2006/q2/060405a_nr.html).

licenses. Boeing's experience providing aeronautical mobile-satellite services ("AMSS") to support government operations makes it well positioned to provide additionally VMES to government customers using some of the same technologies and network capacity.

Finally, Boeing is a global leader in the design, manufacture and launch of satellite communications networks for governmental and commercial customers. Boeing's diverse interests in this proceeding enable Boeing to convey a balanced position with respect to encouraging growth in the satellite industry through the introduction of new products and services, while at the same time ensuring that existing services are not subject to an unnecessary risk of harmful interference.

I. INTRODUCTION

The *VMES NPRM* is the third recent proceeding in which the Commission has considered rules and procedures for the commercial introduction of FSS earth stations on mobile platforms. This vehicle-specific approach to the Commission's regulatory function has been at the behest of the satellite industry, which appears to have focused on these issues one commercial opportunity at a time.

Unfortunately, the industry's incremental approach has resulted in inconsistent and, arguably, incompatible regulatory structures for a group of satellite communications technologies that are functionally identical. The technologies that enable FSS earth stations mounted on mobile platforms to communicate with FSS satellites in a two degree spacing environment are essentially the same, regardless of whether the technologies are used on trucks, ships or aircraft. Indeed, Boeing has at various times provided all three services using a single network, including multiple antenna types and multiple services simultaneously.

Therefore, the Commission should employ this opportunity to adopt a consolidated and coherent regulatory structure for FSS earth stations on mobile platforms. The Commission currently has three pending proceedings addressing FSS earth stations on mobile platforms. The Commission should either consolidate these proceedings, or address each of them on a consolidated, or at least, concurrent, basis.

II. THE COMMISSION SHOULD ADOPT INTERFERENCE RULES FOR FSS EARTH STATIONS THAT DO NOT DISCRIMINATE BASED ON TECHNOLOGY, APPLICATION OR MOUNTING PLATFORM

As the Commission observes in its *NPRM*, the FSS is defined as a radiocommunications service involving earth stations at “given positions” and “fixed locations.”⁵ This definition, however, no longer reflects the technical capabilities of the satellite industry.⁶ FSS earth stations can be employed in mobile environments using a number of design technologies that enable them to comply fully with the Commission’s interference limits for FSS networks in a two degree spacing environment.

The *NPRM* discusses many of the technologies that enable earth stations on mobile platforms to comply with FSS interference limits, including active radio frequency tracking and predictive tracking antennas, electronic phased array antennas and spread spectrum modulation techniques. All of these technologies have a common element – their successful use is not dependent on the type of structure or vehicle on which they are mounted. Most of these technologies can perform equally well regardless

⁵ See *NPRM*, n.1 (citing 47 C.F.R. § 2.1).

⁶ The definition in Section 2.1 of the Commission’s rules also no longer reflects the domestic or international regulatory environment, where Earth Stations onboard Vessels (“ESVs”) qualify as an application of the FSS.

of whether an earth station is attached to a mobile vehicle on the ground, at sea, or in the air.

Obviously, certain technical and practical considerations may limit the fungible nature of earth station technologies. Earth stations on aircraft generally move much faster than earth stations on ships or trucks and must be more lightweight. At the same time, earth stations on trucks must be capable of adjusting to constant changes in pointing angle resulting from uneven driving conditions. Earth stations on trucks often must be much smaller than earth stations on ships or aircraft. It may also be much more difficult to protect the general public from radiation hazards resulting from earth stations on trucks or other terrestrial vehicles.

These distinguishing characteristics, however, do not justify substantially divergent regulatory treatment in Parts 2 and 25 of the Commission's rules with respect to sharing with the FSS. Instead, the Commission should adopt technically-neutral regulations that do not discriminate against any particular technology or service based on the mounting vehicle.⁷ In particular, the Commission's rules should provide primary status to any earth station licensee that can demonstrate that its earth stations on mobile platforms can operate in compliance with the aggregate Section 25.222(a) interference requirements that are currently applicable to ESVs in the Commission's rules.

The adoption of a technologically-neutral approach for all earth stations mounted on mobile platforms would further the goals and objectives that the Commission

⁷ The Commission has recognized the importance of adopting technically-neutral regulations in other satellite proceedings. *See, e.g.*, Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-Band, IB Docket No. 02-19, *Report and Order*, 18 FCC Rcd 14708, 14711, ¶ 10 (2003) (requiring a technologically-neutral approach, not favoring any particular technology or operational method, for non-geostationary FSS systems in the Ka-band).

expressed in its *ESV Order* for “market-driven deployment of broadband technologies.”⁸

As the Commission observed:

Broadband technologies encompass all evolving high-speed digital technologies that provide consumers integrated access to voice, high-speed data, video-on-demand, and interactive delivery services, which are becoming a fundamental component of modern communications.⁹

The growth in demand for broadband services exists in every mobile market segment, including terrestrial and aeronautical. Therefore, the Commission’s conclusions in its *ESV Order* are equally applicable to VMES and aeronautical applications as well.

In supporting a technically-neutral approach, Boeing recognizes that the Commission may still need to address application-specific considerations when authorizing the operation of FSS earth stations on mobile platforms. In limited instances, this may require discrete technical restrictions in Part 25 of the Commission’s rules that apply solely to VMES, ESVs or aeronautical earth station applications. Rather than attempt to anticipate each such consideration in Part 25 of the Commission’s rules, however, the Commission should address most such considerations on a case-by-case basis in the licensing conditions that are imposed in individual blanket licenses for FSS earth stations on mobile platforms.

For example, FSS earth station licenses authorizing the use of VMES on trucks in urban and heavy traffic environments may require additional conditions to protect the public from radiation hazards. It may also be necessary to limit significantly the

⁸ Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz Bands, IB Docket No. 02-10, *Report and Order*, 20 FCC Rcd 674, 676, ¶ 4 (2005) (“*ESV Order*”).

⁹ *Id.* (citing *Federal Communications Commission Strategic Plan FY 2003-FY 2008, Means and Strategies to meet Goal 1 - Broadband*, page 10).

permissible minimum elevation angle of VMES that are mounted on vehicles that may operate adjacent to higher profile vehicles (such as buses) on city streets or highways.

Prior to addressing such service-specific issues, however, the Commission should use the present opportunity to develop technically-neutral requirements for FSS earth stations in mobile environments. As noted in the *NPRM*, the Commission currently has pending three proceedings addressing service and licensing rules for earth stations (both fixed and mobile) in the Ku-band FSS frequencies.¹⁰ It would be both administratively convenient and technically appropriate to combine these proceedings (or at least the two proceedings addressing VMES and AMSS), either through a consolidated order or, if deemed necessary, through a further notice. Alternatively, the Commission could concurrently issue orders in each of the open proceedings adopting the same, or substantially similar, rules and requirements for each type of FSS earth station in a mobile environment.

As discussed in the following sections of these comments, such a consolidated approach would not only establish regulatory symmetry,¹¹ it will be necessary to ensure that certain FSS technologies and applications, such as AMSS, are not unfairly burdened by arbitrarily inconsistent regulatory treatment.

¹⁰ See *NPRM*, ¶ 13 and n.28.

¹¹ Regulatory symmetry would also streamline the resulting rules into one section rather than three sections of substantially similar rules.

A. The Commission Should Refrain From Designating VMES as an Application of the FSS in the Ku-Band Without Concurrently Designating Aircraft Mounted Earth Stations as an Application of the FSS in the Ku-Band

Boeing has been a longstanding advocate of regulatory measures that enable the commercial introduction of earth stations on mobile platforms in Ku-band FSS spectrum. Boeing petitioned the Commission to create a secondary allocation and service rules for AMSS in the Ku-band.¹² Boeing also strongly supported the introduction of ESVs as a primary application of the FSS.

Boeing further supports the introduction of VMES in Ku-band FSS spectrum on a primary basis. Boeing, however, urges the Commission to refrain from taking such action without concurrently modifying the regulatory status of AMSS operations that are currently provided in Ku-band FSS spectrum. As noted previously in these comments, Boeing is under contract with the federal government to provide AMSS services to support critical government functions. As a worldwide leader in the aircraft manufacturing industry, Boeing also supports the continuing development of commercial AMSS services as an important benefit to the flying public.

Boeing has long believed that the existing secondary allocation for AMSS would be adequate to protect its aeronautical services and permit them to operate on a compatible basis in the Ku-band with primary FSS operations. Boeing, however, now questions whether such secondary regulatory status will be adequate in light of the present VMES proceeding.

¹² Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum in the 14-14.5 GHz Band to the Aeronautical Mobile-Satellite Service ("AMSS") and To Adopt Licensing and Service Rules for AMSS Operations in the Ku-Band, The Boeing Company, Petition for Rulemaking filed July 21, 2003 ("Boeing Petition" or "Petition").

As the Commission acknowledges in the *NPRM*, VMES services could raise interference concerns for AMSS operators and FSS networks in two ways. First, despite the best efforts of all involved, some VMES applications may not function as anticipated in all operational environments, raising the possibility of harmful interference to other Ku-band spectrum users. Concerns about such interference are raised in this proceeding by both the Commission¹³ and satellite network operators.¹⁴

If such interference does occur, operators of adjacent satellites and VSAT networks will presumably have adequate recourse under the Commission's rules to require its cessation. Secondary AMSS network operators, however, may lack adequate administrative recourse to demand such corrective measures. Due to AMSS's current classification as a secondary allocation, incumbent AMSS network operators lack any right to protection from harmful interference from later coming primary service operators.

Second, the *NPRM* thrice suggests that ultra-small VMES terminals may be more susceptible to harmful interference than existing FSS terminals.¹⁵ The *NPRM* states that if VMES is given primary status, "incumbent and future FSS systems would be in a

¹³ See *NPRM*, ¶¶ 15, 50 and 72 (expressing concerns that some classes of proposed VMES terminals would not operate compatibly in the Commission's Ku-band two-degree spacing environment for FSS). The Commission observed that "[w]hatever the design specifications of a VMES antenna tracking mechanism, the possibility exists that prevailing off-road conditions will cause design specifications to be exceeded." *Id.*, ¶ 50.

¹⁴ See *id.*, ¶ 48 n.100 (noting concerns expressed by SES Americom and Qualcomm regarding possible interference from small VMES antennas); ¶ 52 (noting additional concerns of SES Americom); see also *id.*, ¶ 19 (noting acknowledgement of General Dynamics that it is impossible to construct a VMES tracking system that will meet the 0.2 degree antenna pointing requirement under all possible circumstances).

¹⁵ See *id.*, ¶¶ 17 n.32, 19 and 66.

position of having to provide protection to VMES antennas that are more susceptible to interference than traditional FSS antennas.”¹⁶

With respect to this latter issue, Boeing strongly concurs with the Commission’s observation that VMES terminals should be protected in the Ku-band only to the extent that they meet the requirements of Sections 25.209(a) and (c) of the rules.¹⁷ Nevertheless, Boeing remains concerned that VMES operators may attempt to seek additional protection for sensitive VMES terminals from potential interference caused by FSS satellites transmitting to secondary AMSS terminals. In light of the fact that transmissions to AMSS terminals remain a non-conforming use of the 11.7-12.2 GHz band, these same VMES operators may seek the cessation of adjacent AMSS networks.

The spectrum sharing issues for aeronautical services in Ku-band FSS spectrum are not limited to concerns about harmful interference, but extend to concerns about inter-system coordination as well. As the Commission observed in the *ESV Order*, “inter-system coordination among FSS operators can be more readily accomplished if each service within the allocation is afforded primary status.”¹⁸ In the increasingly congested Ku-band FSS frequencies, operators of AMSS services may have difficulty maintaining coordination for their operations in competition with primary VMES, ESV and traditional VSAT services. The resulting regulatory burdens could be detrimental to the growth of broadband aeronautical services in the Ku-band. As the Commission concluded with

¹⁶ *Id.*, ¶ 17 n.32.

¹⁷ *See id.*, ¶ 66 (observing that transmissions from a space station are protected only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the relevant antenna performance standards set out in section 25.209).

¹⁸ *ESV Order*, ¶ 78.

respect to ESVs, “allocating ESV operations on a secondary basis conflicts with the fundamental goal of this *Order* to encourage ESV use of the Ku-band by offering a less restrictive operating environment with greater, *i.e.*, primary, regulatory rights.”¹⁹

The solution to these problems is the concurrent adoption of a new regulatory approach addressing both VMES and aeronautical terminals in the Ku-band. As acknowledged by the Commission, such rules could be patterned generally after the ESV rules that were recently adopted by the Commission. Broadly speaking, such rules should treat as a primary service any earth station on a mobile platform that can satisfy the aggregate Section 25.222(a) interference limits that were adopted for ESV networks in the Commission’s two degree spacing environment.²⁰

In raising this proposal, Boeing is not suggesting that a new proceeding be initiated to convert the existing secondary AMSS allocation to a primary allocation. Instead, the Commission should treat FSS earth stations mounted on aircraft in the same manner that it is proposing to treat VMES. Specifically, all aircraft-mounted earth stations (suitably referred to as “AMES”)²¹ that comply with the aggregate Section 25.222(a) interference limits should be deemed to be an application of the primary FSS

¹⁹ *Id.*

²⁰ Boeing continues to believe, however, that in international areas where two-degree spacing is not the norm, higher power operations should be permitted. *See* Petition for Partial Clarification or Reconsideration of The Boeing Company, IB Docket No. 02-10, at 6-12 (filed March 2, 2005) (“Boeing ESV Petition for Partial Clarification”).

²¹ Boeing has developed the term, “aircraft-mounted earth stations” or “AMES” rather than employing the existing term, “aircraft earth stations” or “AES.” This is because the Commission’s rules define AES as “a mobile earth station in the aeronautical-mobile satellite service located on board an aircraft.” 47 C.F.R. § 87.5. In light of the extensive use of the term “AES” in FCC and FAA regulations, it may be appropriate to establish a new term, rather than modify the definition of the existing term.

allocation. This would parallel the course of action proposed in this proceeding which would leave unchanged the existing secondary LMSS allocation, but would allow compliant VMES terminals to operate in the primary FSS allocation. As discussed below in Section II. C. of these comments, such action can be taken by the Commission either as a part of this proceeding, the Commission's existing AMSS rule making proceeding, or through a combination of that proceeding and this proceeding.

B. The International Nature of Aeronautical Services Does Not Lessen the Need for the Commission to Designate AMES as an Application of the Ku-Band FSS in the United States

The International Telecommunication Union ("ITU") currently does not recognize VMES or AMES as permissible applications of the primary FSS allocation in the Ku-band. The *NPRM* suggests that many VMES networks are likely to operate solely in the United States, suggestion that their current lack of international recognition is potentially less relevant than that of ESV and AMES networks, which are inherently international in nature.²² VMES proponents, however, appear to acknowledge that use of VMES by the U.S. military is likely to involve operations in other regions of the world.

In any event, the fact that AMES services are more likely to see international service, however, does not lessen the need for the Commission to recognize AMES as a permissible application of the Ku-band FSS in the United States. Operators of aeronautical earth station networks do not need the Commission to designate AMES as an application of the FSS in order to permit them to provide services in the United States. Aeronautical earth station network operators can already provide such services both

²² See *NPRM*, ¶ 21.

inside and outside the United States using the existing secondary AMSS allocation in the Ku-band.

Instead, as explained in the previous section, operators of aeronautical earth station networks need the Commission to designate AMES as an application of the FSS in order to ensure that aeronautical services have coordination parity with, and are protected from harmful interference from, VMES networks in the United States. In this regard, operators of aeronautical earth stations networks do not currently require regulatory recognition for AMES as an application of the FSS outside the United States because VMES is not currently recognized as an application of the FSS outside the United States. If, at some later point, VMES proponents seek regulatory recognition for VMES outside the United States, operators of aeronautical earth station networks may concurrently seek international regulatory recognition for AMES as a primary application of the FSS in the Ku-band.

C. The Commission Has Provided Adequate Notice to Designate AMES as an Application of the FSS in the Ku-Band

The Commission has provided adequate notice to the public to elevate both VMES and AMES to primary applications of the Ku-band FSS service either in a single order in the VMES proceeding or in two concurrently-issued orders, one addressing VMES and the other addressing the currently-pending AMSS proceedings. Administrative procedure permits the Commission to take action in a rule making proceeding if the action is a “foreseeable outcome of the proceeding.”²³

²³ In the Matter of Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55, *Memorandum Opinion and Order*, 20 FCC Rcd 16015, 16029-16030, ¶ 32 (2005).

The Commission has provided adequate notice in the *NPRM* to elevate both VMES and AMES to primary applications of the FSS in the Ku-band. With respect to AMES, the Commission seeks comment in the *NPRM* on Qualcomm’s proposal for the Commission to “adopt an antenna threshold rule for all categories of service that employ earth stations, including... AMSS, and ESV stations....”²⁴ Although the Commission may have considered the Qualcomm proposal “overly broad” for the VMES proceeding in certain respects, the Commission’s consideration of the proposal and request for comment provides adequate notice to the public that the regulatory treatment of AMES may be addressed in this proceeding. Further, the Commission sought comment on the relevance of the current international recognition of LMSS, ESV, and AMSS to its consideration of a change to the domestic allocation status for VMES.²⁵ This further raises the issue in the *NPRM* of the appropriate regulatory treatment of AMES. Finally, the Commission states that the *NPRM* is interrelated with four other pending proceedings, including the AMSS proceeding, and seeks comment on how those proceedings may be relevant to the rules for VMES.²⁶ Based on such discussion of the regulatory treatment of AMES and the pending AMSS proceeding, a primary allocation for AMES is a “foreseeable outcome” of the *NPRM*, and therefore the public has been provided adequate notice that such action may be taken. The Commission therefore can elevate both VMES and AMES to primary status in a single order in the VMES proceeding.

²⁴ *NPRM*, ¶ 66.

²⁵ *See id.*, ¶ 21.

²⁶ *See id.*, ¶ 13.

Alternatively, the Commission has provided adequate notice in the *AMSS NPRM* to elevate AMES to a primary application of FSS in a separate order in that proceeding. In the *AMSS NPRM*, the Commission seeks comment on “rules for allocation and procedures for licensing AES terminals in the AMSS.”²⁷ In doing so, the *AMSS NPRM* specifically raises the question of treating AES terminals as primary in the 11.7-12.2 GHz band²⁸ and seeks comment on making AMSS co-secondary in the 14.2-14.5 GHz band.²⁹ Finally, the Commission seeks comment on the interrelation between a secondary allocation for AES terminals in the 14.0-14.5 GHz band and the primary allocation for ESVs in the same band.³⁰ This issue necessarily raises the question of band sharing between primary ESVs and secondary AES terminals and whether AMES should be elevated to primary to facilitate such sharing. Elevating AMES to primary status is a “foreseeable outcome” of the *AMSS NPRM* and therefore the Commission has provided adequate notice to the public of such action. As a result, the Commission could issue two orders, one in the VMES proceeding and one in the AMSS proceeding, each concurrently elevating their respective mobile services to a primary application of the Ku-band FSS.

²⁷ Service Procedures and Rules to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service, IB Docket No. 05-20, *Notice of Proposed Rulemaking*, 20 FCC Rcd 2906, 2913, ¶10 (2005) (“*AMSS NPRM*”).

²⁸ *See id.*, ¶ 15.

²⁹ *See id.*, ¶ 26. The Commission states “[w]e propose making AMSS co-secondary with the grandfathered LTTS operations, and invite comment.” *Id.* Certainly a foreseeable comment could be a request to elevate AMSS to a primary allocation in the band due to interference or other concerns.

³⁰ *See id.*, ¶ 20.

Finally, if the Commission concludes that it has not provided adequate notice in either the *VMES NPRM* or in the AMSS proceeding to elevate both VMES and AMES to primary status in a single or twin orders, the Commission should issue a further notice of proposed rule making addressing both proceedings to specifically address this issue.

III. VMES AND AMES OPERATIONS SHOULD BE PERMITTED THROUGHOUT THE KU-BAND FSS FREQUENCIES

Boeing supports the Commission's proposed footnotes and treatment of VMES in the Ku-band frequencies. Boeing further supports the same treatment for AMES in the Ku-band frequencies.

A. A Footnote Should Be Added to the U.S. Table of Frequencies for the 11.7-12.2 GHz and 14.0-14.5 GHz Bands Addressing Both VMES and AMES

Boeing supports the footnote contained in the Commission's proposed rules to show VMES as an application of the FSS with primary status in the 11.7-12.2 GHz and 14.0-14.5 GHz bands.³¹ The footnote is essential to provide protection for VMES in the bands. Boeing agrees with the Commission's goal of ensuring that the U.S. Table of Frequencies and the Commission's rules accurately reflect the types of services that are authorized to use the band.³²

In addition, the Commission should add AMES to the new VMES footnote for the 11.7-12.2 GHz and 14.0-14.5 GHz bands, thereby enabling AMES to operate as a

³¹ See *NPRM*, ¶ 40.

³² See *id.*, ¶ 27.

primary application of the FSS. Such a footnote would be in place of the footnote proposed by the Commission in the *AMSS NPRM*.³³

B. VMES and AMES Operations Should Be Permitted in the 10.95-11.2 GHz and 11.45-11.7 GHz Bands on a Non-Protected Basis

Boeing supports the adoption of the footnote proposed by the Commission in the *NPRM* to include VMES terminals in the extended Ku-band.³⁴ The Commission, however, should include AMES in the new VMES footnote.³⁵ In its Reply Comments in the ESV proceeding, Boeing supported Intelsat's proposal to permit ESV receive

³³ See *AMSS NPRM*, ¶ 15. Boeing proposes that the footnote read as follows:

NGyyy In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Vehicle-Mounted Earth Stations (VMES) and Aircraft-Mounted Earth Stations (AMES) as regulated under 47 CFR part 25 are an application of the fixed-satellite service and may be authorized to communicate with space stations of the fixed-satellite service on a primary basis.

In addition, to be consistent with the definition of VMES, Boeing proposes the following definition for AMES for inclusion in Section 25.201 of the Commission's rules:

Aircraft-Mounted Earth Station (AMES). An AMES is an earth station, operating from an airplane, or motorized vehicle that travels primarily in the air, that receives from and transmits to fixed-satellite space stations and operates pursuant to the requirements set out in § 25.XXX of this part.

³⁴ See *NPRM*, ¶ 39.

³⁵ Boeing proposes that the footnote read as follows:

NGxxx In the bands 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-earth), Vehicle-Mounted Earth Stations (VMES) and Aircraft-Mounted Earth Stations (AMES) as regulated under 47 CFR part 25 may be authorized to communicate with space stations of the fixed-satellite service but must accept interference from stations of the fixed service operating in accordance with the Commission's Rules.

operations in the 10.95-11.2 GHz and 11.45-11.7 GHz bands.³⁶ In the *ESV Order*, the Commission determined that ESVs could maintain downlink operations in these bands consistent with FS operations and that ESVs in the band must accept harmful interference from terrestrial systems operating in accordance with the rules.³⁷ Boeing supported these conclusions.³⁸

There is no technical difference between ESVs, VMES and AMES that requires divergent treatment or additional protection in the 10.95-11.2 GHz and 11.45-11.7 GHz bands. Similar to ESVs, VMES and AMES should be permitted to operate in the bands on a non-protected basis and should accept interference from FS operations in the band. This is particularly important to facilitate coverage of parts of the United States, such as Alaska, that are located close to the boundary between ITU-R Regions which have different bands allocated for FSS use.

C. VMES and AMES Operating in the 14.0-14.2 GHz Band Should Be Allowed Within the 125 Km Protection Zone Around the Tracking and Data Relay Satellite System Receive Facilities, But Should Coordinate With Such Facilities

Boeing supports the Commission's proposal that VMES operators coordinate on an equal basis with the Tracking and Data Relay Satellite System ("TDRSS") receive facilities in Guam and White Sands, New Mexico within the 125 km protection zone as a condition of the operator's license.³⁹ Boeing supported the National Telecommunications

³⁶ See Reply Comments of The Boeing Company, IB Docket No. 02-10, at 4 (filed March 24, 2004) ("Boeing ESV Reply Comments").

³⁷ See *ESV Order*, ¶ 86.

³⁸ See Boeing ESV Reply Comments at 5.

³⁹ Boeing would also support a smaller, more technically-based protection zone.

and Information Administration (“NTIA”) Interdepartment Radio Advisory Committee coordination process in the ESV proceeding. Boeing argued, however, that the coordination requirement should not be a prerequisite to granting an ESV license, but rather a condition of any such license.⁴⁰ In the *ESV Order* the Commission followed this approach and did not require the coordination as a prerequisite to licensing.⁴¹ The same condition was applied to Boeing’s AMSS authorization.⁴²

The Commission proposes the same approach for the coordination requirement for VMES and Boeing supports the proposal for both VMES and AMES. Boeing expects, however, as it did in its ESV Comments,⁴³ that the proposed new TDRSS facility to be located in the mid-Atlantic region will be designed to operate within generally accepted earth station performance standards in order to accommodate other services in the band. The Commission apparently shares this expectation.⁴⁴

IV. ASSUMING THE OFF-AXIS EIRP DENSITY LIMITS ARE MET, ADDITIONAL RESTRICTIONS ARE NOT NECESSARY FOR VMES AND AMES NETWORKS

Boeing urges the Commission to develop technically-neutral rules for earth stations mounted on mobile platforms to the greatest extent possible. Technologies exist

⁴⁰ See Boeing ESV Comments at 13.

⁴¹ See *ESV Order*, ¶ 90.

⁴² See The Boeing Company, Application for Blanket Authority to Operate Up to Eight Hundred Technically Identical Transmit and receive Mobile Earth Stations Aboard Aircraft in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, File No. SES-LIC-20001204-02300, Call Sign E000723, Order and Authorization, 16 FCC Rcd 22645, 22647, ¶ 6 (2001) (“*Transmit-Receive Order*”).

⁴³ See Boeing ESV Comments at 12.

⁴⁴ See *NPRM*, ¶ 31.

that enable FSS terminals on mobile platforms to meet the off-axis e.i.r.p. density limits established by the Commission in Section 25.222(a) of the Commission's rules for a two degree spacing environment. Furthermore, additional technologies will continue to be developed in the future.

Such technological development, however, could be restricted unnecessarily by additional requirements such as the $10 \cdot \log(N)$ rule, pointing accuracy, cease transmit, minimum antenna size, antenna tracking performance or tracking accuracy. The Commission appeared to acknowledge this fact in its *ESV Order*, concluding that “[w]e agree with Boeing that adopting off-axis e.i.r.p.-density rules, as opposed to adopting multiple operating restrictions that accomplish the same objective, is the proper approach to ESV regulation.”⁴⁵ The Commission justified this conclusion by observing that, “in addition to providing simpler service rules, this approach also provides maximum flexibility to ESV operators in implementing the two-degree spacing limits.”⁴⁶

The use of off-axis e.i.r.p. density limits, without additional regulatory restrictions, would also be the most appropriate approach for the regulation of VMES and AMES services. As an example, Boeing's AMSS operations are able to meet the Commission's off-axis e.i.r.p. density limits without such additional requirements.⁴⁷ Finally, assuming mobile terminals are able to meet the applicable mask, both government and commercial VMES and AMES applications should be authorized.

⁴⁵ *ESV Order*, ¶ 14.

⁴⁶ *Id.*

⁴⁷ *See infra* p 22.

A. VMES and AMES Operations Should be Subject to the Commission's Off-Axis EIRP Density Limits in Section 25.222(a) of the Rules

Boeing supports the Commission's proposal to apply the off-axis e.i.r.p. density limits contained in Section 25.222(a) of the Commission's rules to VMES.⁴⁸ Boeing believes that such a requirement is appropriate without arbitrarily incorporating a one dB reduction in the mask.⁴⁹ Furthermore, Boeing believes that the Section 25.222(a) mask should apply not only to VMES, but to AMES as well.

In supporting such an approach, Boeing is aware that the Commission is considering in the Part 25 proceeding possible adjustments to the applicable off-axis e.i.r.p. density limits for FSS in the Ku-band.⁵⁰ If such adjustments are adopted, they should be equally applicable to all FSS earth stations on mobile platforms, including VMES, ESVs and AMES.

Finally, satellite operators providing services to VMES and AMES networks should have the right to seek coordination of more relaxed limits than those included in Part 25.222 of the Commission's rules if such adjustments are acceptable to adjacent satellite operators. The freedom to coordinate mutually-beneficial operator-to-operator agreements has proven very effective with respect to the provision of satellite services to fixed VSAT networks. No reason exists to refrain from providing this same flexibility to satellite operators providing services to VMES and AMES networks.

⁴⁸ *NPRM*, ¶ 48.

⁴⁹ *See id.*, ¶ 50.

⁵⁰ *See* 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage By, Satellite Network Earth Stations and Space Stations, IB Docket No. 00-248, *Sixth Report and Order and Third Further Notice of Proposed Rulemaking*, FCC 05-62, 20 FCC Rcd 5593, 5622, ¶ 74 (2005) (“*Sixth Report and Order and Third Further Notice*”).

B. The Commission Should Require an Aggregate EIRP Density Envelope Rather Than the $10 \cdot \log(N)$ Rule

Boeing shares the concerns of other parties in this proceeding that the $10 \cdot \log(N)$ rule as currently written does not permit the use of aggregate system power control, or other spectrally-efficient technologies.⁵¹ Boeing therefore believes that the $10 \cdot \log(N)$ rules should not be applied to VMES or AMES services. Instead, the power limits that were adopted by the Commission in Section 25.222(a) of the Commission's rules should be treated as aggregate limits for VMES and AMES.

As Boeing explained in the ESV and AMSS proceedings, proven technologies exist that can ensure that the limits are met without arbitrarily apportioning an equal percentage of the interference to each mobile terminal operating in a network.⁵² For example, Boeing's "bandwidth-on-demand" spectrum sharing approach enables the efficient and effective allocation of network capacity among large numbers of mobile terminals without resulting in harmful interference to adjacent networks.⁵³ Boeing's bandwidth-on-demand system uses dynamic power control to ensure that aggregate off-axis e.i.r.p. density limits are maintained, while varying the transmit power levels of individual antennas based on capacity needs. Boeing has successfully operated its bandwidth-on-demand system without causing harmful interference to other systems.

The Commission should therefore modify the requirement in Section 25.222(a) of its rules to include an explicit provision stating that the off-axis e.i.r.p. density limits are aggregate limits with respect to their application to VMES and AMES. Although the

⁵¹ See *NPRM*, ¶ 57.

⁵² See *id.*

⁵³ See *id.*

aggregate e.i.r.p. density envelop must still be met, it is unnecessary to impose specific variable data rate rules. Applying the existing $10 \cdot \log(N)$ requirement in Section 25.222(a) to VMES and AMES would potentially limit the existing and future technologies for spread-spectrum systems without reducing interference or otherwise serving the public interest.

C. The Commission Should Adopt a Three-Degree Starting Angle Outside the GSO Orbital Plane

The Commission seeks comment on ViaSat's proposal to permit VMES terminals to operate at greater power densities in the non-geostationary orbit plane.⁵⁴ The Commission proposes to start the antenna gain pattern envelope at three degrees off-axis rather than the current 1.25 degrees from the antenna main lobe.⁵⁵ The Commission made the three-degree adjustment in the Part 25 proceeding to facilitate development of more advanced antennas⁵⁶ and the same reasoning holds for VMES and AMES. Boeing supports the Commission's proposal to revise the start of the antenna gain pattern envelope to three-degrees for VMES. Boeing further proposes the adoption of identical treatment for AMES.

D. The Commission's ESV Rules Regarding Pointing Accuracy and Transmission Cessation Should Not Be Applied to VMES or AMES

If an applicant for a blanket earth station license can demonstrate to the Commission that its VMES or AMES terminals can meet the aggregate off-axis e.i.r.p.

⁵⁴ See *NPRM*, ¶¶ 67-69.

⁵⁵ See *id.*

⁵⁶ See *Sixth Report and Order and Third Further Notice*, ¶ 38.

density limits contained in Section 25.222(a) of the Commission's rules, it is unnecessary to further require the licensee to comply with pointing accuracy or transmission cessation requirements.

In some cases, VMES or AMES licensees may choose to employ pointing accuracy or transmission cessation technologies to enable their operations to comply with Section 25.222(a) of the Commission's rules. In such circumstances, however, the pointing accuracy and transmission cessation technologies are subsumed into the off-axis e.i.r.p. density limits, and do not need to be separately mandated by the Commission.

At the same time, many VMES or AMES licensees may employ other technologies to ensure compliance with the Section 25.222(a) off-axis e.i.r.p. density limits. Some of these technologies, such as spread-spectrum modulation techniques, are not dependent on pointing accuracy and transmission cessation technologies. Furthermore, such advanced technologies may be incompatible with the proposed pointing accuracy requirements. For example, the pointing accuracy requirements proposed in the *NPRM* do not account for smaller beam widths associated with VMES terminals that are generally much smaller than terminals for ESVs.

Instructive precedent exists for refraining from imposing pointing accuracy and transmission cessation requirements on VMES and AMES licensees. For example, the Commission did not impose such rules on Boeing's AMSS license because Boeing demonstrated that its terminals would meet the applicable e.i.r.p. density mask without such requirements. In the *Transmit-Receive Order*, the Commission required Boeing to submit a report addressing "variations in aggregate off-axis e.i.r.p. caused by mis-

pointing of AMSS mobile terminal antennas....”⁵⁷ Boeing was able to demonstrate compliance with the mask using an algorithm that accounts for mis-pointing of AES antennas, variation in AES antenna pattern, and variation in AES transmit e.i.r.p.⁵⁸ Information regarding these factors is transmitted to Boeing’s network operations center (“NOC”) to compute an aggregate off-axis e.i.r.p. envelope for the antennas operating on the network.⁵⁹

Boeing plans to use identical techniques for its VMES services. In fact, Boeing will most likely employ the same NOC, the same satellite transponders, and the same spectrum sharing techniques for many of the VMES, AMES and ESV services that Boeing makes available to its customers. Boeing’s VMES, AMES and ESV applications will most likely operate as a part of the same network, with VMES, AMES and ESV terminals sharing the same spectrum without regard for the types of vehicles on which they are mounted.

Other satellite service providers may employ similar, application-neutral approaches. The Commission should encourage such innovation and resulting efficiencies by permitting satellite service providers to select freely the technologies that they will use to comply with the Section 25.222(a) off-axis e.i.r.p. requirements, rather than arbitrarily imposing unnecessary and technology-constraining Part 25 regulations.⁶⁰

⁵⁷ *Transmit-Receive Order*, ¶ 19.

⁵⁸ See Boeing AMSS System License Compliance Report, File No. SES-LIC-20001204-02300, Call Sign E000723, at 3-4 (filed Aug. 14, 2002) (“Compliance Report”).

⁵⁹ See *id.*

⁶⁰ In arguing against the imposition of pointing error and transmission cessation requirements for VMES, Boeing acknowledges that it opposed the wholesale elimination of pointing accuracy requirements for ESV networks in the ESV proceeding. See

E. Regardless of Size, All Receive Antennas Should Be Entitled to the Same Level of Protection

The Commission seeks comment on Qualcomm's proposal to amend Section 25.209 of the Commission's rules to set a threshold on antenna size (possibly 55 centimeters) above which the allocation would be primary and below which it would be secondary.⁶¹ The Commission notes, however, that "[i]f we adopt a primary status for VMES and apply Section 25.209(c), there may be no need for such a rule for VMES earth stations."⁶² Section 25.209(c) provides earth stations with protection from interference only to the degree to which harmful interference would not be expected to be caused to an earth station employing antennas conforming to Sections 25.209(a) and (b).⁶³ The Commission has proposed the same protection in Section 25.XXX(a)(14) of the proposed rules for VMES⁶⁴ and Boeing seeks the same protection for AMES.

As discussed above, Boeing supports a primary allocation for VMES and AMES and agrees with the Commission that if a primary status is adopted there is no need for a threshold antenna size or secondary status below that threshold. The Commission found

Consolidated Opposition to Petitions for Reconsideration or Clarification and Comments of The Boeing Company, IB Docket No. 02-10, at 4 (filed April 21, 2005) ("Boeing ESV Consolidated Opposition"). Boeing took this position because ITU's WRC Resolution 902 (Geneva, 2003), which had been accepted internationally, included the 0.2° pointing accuracy provision. *See id.* Currently, however, there are no internationally accepted provisions for VMES addressing VMES operations. *See NPRM*, ¶ 21. Furthermore, AMSS operations are not subject to a 0.2° pointing accuracy requirements, domestically or internationally. Therefore, no reason exists for the Commission to adopt a 0.2° pointing accuracy requirement for VMES or AMES in this proceeding.

⁶¹ *See id.*, ¶¶ 65-66.

⁶² *Id.* ¶ 66.

⁶³ *Id.* and 47 C.F.R. § 25.209(c).

⁶⁴ *See NPRM*, Appendix B, 25.XXX(a)(14).

no need to adopt a minimum antenna requirement in the ESV proceeding.⁶⁵ Regardless of size, antennas should be provided the same level of protection as an antenna conforming to the Commission's Section 25.209(c) requirements.

F. VMES and AMES Licensing Should Not be Limited to Government Applications

As long as VMES and AMES terminals comply with the applicable off-axis e.i.r.p. density mask, it is not relevant whether the application is government or commercial in nature. The Commission should ensure, however, that the VMES rules implemented will adequately protect other satellite systems and the public if VMES expands beyond military and other government users. Although Boeing's potential VMES services are currently limited to government use, providers of VMES may develop less expensive alternatives that could lead to commercial and more ubiquitous use. The rules developed should account for that possibility.

V. VMES AND AMES SHOULD BE SUBJECT TO APPROPRIATE SYSTEM MONITORING, DATA LOGGING AND EMERGENCY CONTACT REQUIREMENTS

The e.i.r.p. off-axis density limited that were included in Section 25.222(a) of the Commission's rules should be adequate to protect other FSS services in the Ku-band. Regardless of the regulatory restrictions that are adopted, however, some possibility exists that earth station networks may malfunction and unexpectedly direct emissions toward adjacent networks. The Commission's proposed data logging requirements are therefore essential to determine the cause of any harmful interference.

⁶⁵ See *ESV Order*, ¶ 103.

Recognizing this possibility, the Commission should adopt adequate measures to ensure that network operators continuously monitor their operations, reliably record and preserve this information, and be available on a continuous basis to respond to concerns about possible interference.

A. VMES and AMES Networks Should Comply With Data Logging Requirements that are Similar to Those Applied to ESVs

In order to ensure that interference events can be properly identified, investigated, and corrected, VMES and AMES networks should be required to collect, maintain and be able to provide the operating and geo-location information required by Section 25.222(c) of the Commission's rules to the appropriate authorities. Boeing supported this same requirement in the ESV proceeding.⁶⁶

In supporting this requirement, Boeing acknowledges the concerns raised by SES Americom and highlighted by the Commission regarding applying such data logging requirements to some military applications.⁶⁷ The national security concerns that could be raised are serious. Such national security concerns were implicated in the ESV proceeding as well, and Boeing supported the data logging requirements with limitations to address such concerns.⁶⁸

Specifically, the data logging information should not be available real-time via the Internet, but rather should be used internally by the VMES operator to resolve reports of

⁶⁶ See Comments of The Boeing Company, IB Docket No. 02-10, at 26-27 (filed February 23, 2004) ("Boeing ESV Comments").

⁶⁷ See *NPRM*, ¶ 63.

⁶⁸ See Boeing ESV Comments, at 26-27.

interference and be made available to the Commission or NTIA upon request.⁶⁹ For example, if there is interference to an FSS operator that could have been caused by a secondary MSS application or a primary VMES application, the MSS operator must be able to rebut claims of interference that would require cessation of the operator's transmission until the interference is remedied.

The Commission further proposes to require VMES operators to collect data in twenty minute intervals, the same interval that was adopted for ESVs⁷⁰ Boeing recommends that the data collection interval for VMES be shortened to every ninety seconds. The twenty minute interval was adequate for ESVs on slow-moving ships, the movements of which are highly predictable. A twenty minute interval, however, will likely be inadequate for vehicles, which can travel at much greater speeds and with much less predictability due to curves and grade changes in roads. The Commission recognized the vehicle-specific nature of the data collection issue in its *AMSS NPRM* where the Commission proposed a requirement for "real-time" tracking.⁷¹ Recognizing that terrestrial vehicles generally operate at much slower speeds than airplanes, but often much faster than ships, Boeing proposes a ninety second interval for VMES data logging.⁷²

⁶⁹ In addition, national security concerns can be addressed in exceptional cases by the grant of a waiver by the Commission.

⁷⁰ See *NPRM*, ¶ 62 and 47 C.F.R. § 25.222(c)(1).

⁷¹ See *AMSS NPRM*, ¶ 54.

⁷² The Commission should also clarify the method that a network operator is required to employ when collecting data at regular intervals. For example, location data should be collected as soon as a VMES or ESV terminal begins a transmission and data collection should be repeated every thirty seconds or twenty minutes (whichever is applicable) thereafter. In contrast, an ESV network operator should not be permitted to collect

Finally, although Boeing supports the adoption for VMES and AMES of the general data logging requirements that were included in Section 25.222(c) of the Commission's rules, Boeing believes that it would be adequate to require network operators to maintain such data only for ninety days, rather than for a full year, as was required by the Commission for ESV networks. A ninety-day holding period should be adequate to address interference concerns, which are generally raised by network operators at the time of an interference event, rather than weeks or months later.

B. The Commission Should Require VMES and AMES Operators to Maintain a 24/7 U.S. Point of Contact, But Not a U.S. Earth Station Hub

Boeing supports the Commission's proposal that system licensees maintain a 24/7 point of contact in the United States.⁷³ The 24/7 point of contact is necessary to address interference concerns given the spectrum sharing issues described in the *NPRM*. This requirement was included in the ESV rules⁷⁴ and Boeing's AMSS authorization.⁷⁵ The proposed VMES rules also require that VMES operators control all VMES terminals through the use of an earth station hub located in the United States.⁷⁶ The ESV rules, on the contrary, do not require an earth station hub if the U.S. 24/7 point of contact is

information at arbitrary intervals (such as on the hour, and every 20 minutes and 40 minutes after the hour), because such an approach may fail to collect any data from ESV terminals that begin and end their transmissions in between two of the designated data collection times.

⁷³ See *NPRM*, ¶ 78.

⁷⁴ See 47 C.F.R. § 25.222(c)(3).

⁷⁵ *Transmit-Receive Order*, ¶ 19.

⁷⁶ See *NPRM*, Appendix B, 25.XXX(a)(10)(ii).

maintained with the authority and ability to cease transmission on the antennas.⁷⁷ Boeing's AMSS authorization also does not contain a domestic hub requirement.⁷⁸ Effective regulatory oversight can be achieved by the Commission regardless of the location of the hub. There is no reason for the VMES and AMES rules to stray from the ESV rules on this matter and the Commission should not require a U.S. hub to operate VMES and AMES systems.

VI. THE COMMISSION MUST ENSURE THAT MEASURES TO CONTROL RADIATION HAZARDS ARE ADEQUATE TO ADDRESS MOBILE ENVIRONMENTS

Throughout these comments, Boeing has advocated a consolidated approach to the regulatory structure for earth stations mounted on mobile platforms that operate in Ku-band FSS spectrum. The introduction of VMES, however, may raise RF hazard concerns that are not shared by ESV and AMES. In the case of ESV and AMES, access to areas surrounding the earth station – be they crew decks or tarmacs – can be tightly controlled and limited to qualified personnel. With respect to VMES, however, it may be impossible to limit the physical access of the public. Even if VMES terminals are made available only to government agencies, numerous situations may exist where government vehicles are operating in unsecured areas with large numbers of civilians.

The potential for concern is elevated by the fact that VMES units will need to operate using relatively low elevation angles in the United States. As a result, any VMES-equipped vehicle operating on a public highway or in an urban area could

⁷⁷ See 47 C.F.R. § 25.222(c)(3).

⁷⁸ *Transmit-Receive Order*, ¶ 19. The *AMSS NPRM* proposed the 24/7 point of contact regardless of whether or not the hub is in the United States. See *AMSS NPRM*, ¶ 57.

inadvertently direct its transmitting beam into an adjacent vehicle with a higher profile (such as a bus) or into an adjacent building.

To address such concerns, Boeing supports the adoption of labeling requirements and the use of professional installation. Boeing further supports the adoption of requirements that all FSS earth stations on mobile platforms, including VMES, be designed to cease transmissions after signal loss from the satellites. Such measures appear necessary to ensure that the public is not exposed to RF hazards resulting from VMES networks. The Commission may also need to consider whether additional measures are necessary to ensure that VMES does not raise public health concerns in a terrestrial environment.

VII. VMES AND AMES NETWORKS SHOULD BE BLANKET LICENSED AND GRANTED ALSAT AUTHORITY

In the *ESV Order*, the Commission determined that there was adequate justification for, and little risk to, blanket licensing and ALSAT authority for ESVs. There is no reason to stray from that reasoning for VMES and AMES.

A. VMES and AMES Networks Should Be Granted Blanket Licenses

Blanket licensing is necessary because the number and mobile nature of VMES and AMES antennas makes it administratively burdensome and inefficient to license each antenna individually. In the *ESV Order*, the Commission licensed ESVs on a blanket basis because “the number and mobility of ESV locations would make it impractical to license ESVs on a site-by-site basis” and “adopting a blanket licensing approach...allows for the expeditious processing of ESV licenses....”⁷⁹ The Commission further recognized

⁷⁹ *ESV Order*, ¶ 115.

that blanket licensing was preferable because “ESV operators will likely deploy large numbers of technically identical earth stations that will operate over a wide geographic area.”⁸⁰ The same arguments in favor of blanket licensing apply to VMES and AMES.

B. VMES and AMES Networks Should Be Granted ALSAT Authority

Boeing supports extending ALSAT authority to Ku-band VMES operators using the 11.7-12.2 GHz and 14.0-14.5 GHz bands that comply with the off-axis e.i.r.p. density requirements.⁸¹ Boeing supported authorization for both ESV and AMSS operations to communicate with all U.S.-licensed Ku-band FSS satellites and foreign-licensed Ku-band satellites on the Permitted Space Station List to enhance operational flexibility and operators’ competitive standing internationally.⁸² There is no technical justification to disallow ALSAT authority for VMES and AMES operations, assuming the other Commission rules are satisfied, since VMES and AMES systems would be designed to operate with Ku-band FSS satellites and such FSS operations are granted ALSAT authority.

Such authority would also obviate the need for the Commission to process unnecessary earth station modification applications every time a VMES or AMES licensee adds an authorized satellite point of communication to its license. In the *ESV Order*, the Commission recognized that ALSAT authority would “enhance competition and reduce the costs of providing ESV services” because allowing operators the

⁸⁰ *Id.*

⁸¹ See *NPRM*, ¶ 81.

⁸² See Boeing *ESV Comments*, at 28-30 and *Comments of The Boeing Company*, IB Docket No. 05-20, at 35-36 (filed July 5, 2005 with revised copy filed July 6, 2007).

flexibility to alternate satellite providers allows for negotiation of market-based pricing for transponder capacity.⁸³ The same technical, administrative and policy arguments apply for AMES and VMES as for other services provided ALSAT authority like ESVs and routinely licensed VSATs.

VIII. THE COMMISSION SHOULD ENSURE REGULATORY PARITY FOR FEDERAL AND NON-FEDERAL EARTH STATIONS ACCESSING COMMERCIAL SATELLITE SPECTRUM

In the *NPRM*, the Commission requests comment on the impact that a grant of the NTIA's Petition in the Federal Parity proceeding may have on the instant proceeding.⁸⁴ Throughout these comments, Boeing has supported a consolidated regulatory approach for earth stations on mobile platforms operating in Ku-band FSS frequencies. Any earth station technology that can comply with the interference limits included in Section 25.222(a) of the Commission's rules should be authorized on a primary basis. Utilizing this consolidated approach, no need exists to limit access to VMES or AMES terminals to governmental or other specialized customer groups.

Consistent with this approach, Boeing supports the provision of regulatory parity for federal earth stations (be they mobile or fixed) that are communicating with non-government FSS spacecraft. In providing such parity, however, the Commission must ensure that federal earth stations are not effectively provided super-primary status or other preferential treatment with respect to their operations in commercial FSS spectrum.

⁸³ *ESV Order*, ¶ 106.

⁸⁴ See *NPRM*, ¶ 23, n.52 (citing *Amendment to the National Table of Frequency Allocations to Provide Allocation Status for Federal Earth Stations Communicating with Non-Federal Satellites*, Petition for Rulemaking of the National Telecommunications and Information Administration, RM-11341 (Aug. 4, 2006)).

For example, federal systems using VMES or other technologies should not be permitted to evade the Commission's requirements for data logging and other interference protection measures. Any earth stations on mobile platforms that are operated by the federal government in commercial FSS spectrum should be required to comply with the same interference protection measures as non-government earth stations on mobile platforms in order to maintain regulatory parity and facilitate spectrum sharing in Ku-band FSS spectrum.

IX. CONCLUSION

Boeing supports the Commission's proposal to treat VMES as a primary application of FSS in the Ku-band. Concurrent with such action, however, the Commission should provide aeronautical FSS earth station networks with the same primary status and interference protection. Specifically, all aircraft-mounted earth stations that comply with the Commission's two degree interference limits should be deemed to be an application of the existing primary FSS allocation.

Respectfully submitted,

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August 17, 2007